# Rubric-based Formative Assessment in Process Eportfolio: Towards Self-regulated Learning

**Gemma Tur**
gemma.tur@uib.es
University of the Balearic Islands, Spain

**Santos Urbina**
santos.urbina@uib.es
University of the Balearic Islands, Spain

**Dolors Forteza**
dolorsforteza@uib.es
University of the Balearic Islands, Spain

**Abstract**
This article explores the results of a rubric-based formative assessment of an eportfolio task as part of a pedagogical subject on a weekly basis during the first year in the Teacher Education programme of the University of the Balearic Islands. The study aims to explore the possibilities of the rubric usage for formative assessment and in particular, is aimed at exploring the consistency of students' improvement throughout the semester. The literature review briefly covers research on closely related concepts such as formative assessment and feedback along with process eportfolios for reflective tasks, which are all aimed at achieving higher-level cognitive skills and, eventually, self-regulated learning. Data, which is obtained from students' performance and statistically analysed, reveals evidence of the general improvement of results throughout the semester with the majority of students moving from lower to higher levels. Furthermore, data obtained also allows observing some difficulties for reflective skills. Conclusions reflect on challenging implications for sustainable transferrable practices, self-regulated learning and formative assessment.

**Keywords**
Self-regulated learning; formative assessment; rubric, eportfolio

## I. Introduction

Formative assessment has been argued as a coherent approach with universal instructional design (UID) that can answer to students' needs (Dalmau et al., 2010); it has also been related to self-regulated learning (Nicol & Macfarlane-Dick, 2006) through eportfolios (Alexiou & Paraskeva 2010, 2013; Yastibas & Yastibas, 2015) and rubric-based assessment (Panadero & Jonson, 2013). For these reasons, this study is a challenging line of research promoting learning practices based on rubric formative assessment of eportfolios under the self-regulated learning framework in Teacher Education.

In recent years there has been an increase in eportfolio uptake in Higher Education and Teacher Education, in particular (Cheng & Chau, 2013; Wang, 2009). There are a large number of definitions of eportfolio and purposes of eportfolios, and one of the most suitable for metacognitive skills is the process approach (Abrami, Venkatesh, Meyer & Wade, 2013; Meyer, Abrami, Wade, Aslan & Deault, 2010; Galván-Fernández, Rubio-Hurtado, Martínez-Olmo & Rodríguez-Illera, 2017). Process eportfolios are defined as a "purposeful collection of student work that tells the story of a student's effort, progress and/or achievement in one or more areas" (Abrami et al, 2013, p. 1189), which can foster different stages of the self-regulated learning cycle (Abrami et al, 2013; Meyer et al, 2010). Currently, it is accepted that eportfolios have been influenced by the social media (Cambridge, 2009; Author), about which research has also observed the possibilities of social media for diverse educational aims such as critical thinking skills (Herro, 2014), providing feedback and aid self-regulatory learning processes (Gunawardena et al., 2009). Among the wide range of digital services, blogs have been used as eportfolio platforms with which to integrate teaching, learning and assessment in a continuum process (Aguaded, López Meneses & Jaén, 2013; Tur & Urbina, 2016a) and also foster reflection (Biberman-Shalev, 2018) and self-regulated learning (Hatzipanagos & Warburton, 2009). Also, blogs can support feedback as a dialogue in formative assessment (Hatzipanagos & Warburton, 2009) although some drawbacks –such as the design of collaborative learning in the context of assessment– have also been reported (Tur & Urbina, 20116b).

Numerous aims and functions have been reported and among which, as a means of overcoming test-based summative tasks, assessment has been claimed as one of the paramount objectives of eportfolios, since it can promote student-centred and authentic assessment approaches (Gikandi, Morrow & Davis, 2011; Kabilan & Khan, 2012; Karsenti, Dumouchel & Collin, 2014; Rodríguez Illera, Galván & Martínez Olmo, 2013; Yang, Tai & Lim, 2016), which can eventually be orientated towards autonomous and self-regulated learning aims (Raposo & Sarceda, 2010). Formative assessment through rubrics and eportfolio has been related to the self-regulated learning process (Panadero & Jonsson, 2013; Panke, 2014) and in particular, the possibilities for assessment of process eporfolios makes them more advantageous for those better at authentic tasks (Abrami et al, 2013).

Self-regulated learning has been defined as the ability to control one's own thoughts, actions, emotions and motivation to achieve educational aims (Panadero & Alonso-Tapia, 2014). Zimmerman's model (2002) describes the self-regulated process as a cycle of three phases –forethought, performance and self-reflection– in which students cognitively, motivationally and

behaviourally, engage in learning. In the forethought phase students plan learning, which is strategically performed and eventually assessed, in the final phase.

This study is based on previous recent research phases in which rubric results were used to explore students' reflective skills on their eportfolios (as core elements of their personal learning environments) –see Tur, Marín, Moreno and Urbina (2016) and Tur and Urbina (2014). At that stage, it was observed that most students in each group improved their learning although some difficulties were also seen in the reflective part of the task. Thus, it was decided to further explore all rubric results collected during the four academic years in which it was implemented, specifically including the reflection task. Therefore, this study provides consistent evidence of the impact of the rubric-based assessment for learning in the context of eportfolio on students' performance as well as suggesting challenges to the aim of self-regulated learning.

## II. Background

### a. Formative assessment: feedback and rubrics for self-regulated learning

Typically, the two major forms of assessment have been polarised between formative and summative assessment, both of which play a core role in Higher Education: the former has been related to the instructional level whereas the latter has been related to accountability and certification (Gikandi et al., 2011). Formative assessment has been defined by Black and Wiliam (1998) as the activity that provides evidence to adapt teaching to students' actual needs. Although there exists some variability in different studies, it can be said that there is a strong body of research supporting that the use of assessment to inform teaching during the instructional process providing feedback can have significant impact on students' learning and outcomes (Wiliam, 2011). It has been said that for formative assessment to be truly formative and not merely a repetitive series of summative assessments, feedback is crucial (Pachler, Daly, Mor & Mellar, 2010). Eventually, formative assessment together with feedback can empower students for self-regulated learning (Nicol & Macfarlane-Dick, 2006)

The good feedback which fosters self-regulated learning has been defined in seven principles (Nicol & Milligan, 2006; Gikandi et al., 2011): clarifying good performance, facilitating reflection and self-assessment, giving high quality information, encouraging dialogue and self-esteem, and providing opportunities for both students and teachers to improve. Also, personalised and adequate feedback can increase students' feeling of control (Saul & Wuttke, 2011). Feedback should be supported by rubrics (Gaytan & McEwen, 2007; Gikandi et al., 2011) and eportfolios have been suggested as an ideal medium in which to provide it (Peacock, Murray, Scott & Kelly, 2011) by teachers and students themselves (Sellami, 2015).

Rubrics work well in the context of formative assessment since they contain qualitative performance information that can provide feedback (Tierney & Simon, 2004; Penny & Murphy, 2009), inform students about their progress and aid the learning process, all of which enhances self-regulated learning (Panadero & Jonsson, 2013; Fraile, Pardo & Panadero, 2017). From a descriptive definition, rubrics contain two main elements: performance criteria and definitions or ratings. The former consists of the elements of the task; and the latter, the qualitative levels at

which student performance can be assessed (Penny & Murphy, 2009). Rubrics and electronic rubrics have emerged as alternative tools for assessment and in Higher Education different uses for erubrics have been observed: for example, as tools for formative assessment, guidelines and criteria reference (Raposo-Rivas & Gallego-Arrufat, 2016).

Rubrics are often used for the assessment of eportfolios (Strudler & Wetzel, 2011). They orientate the collection of artefacts and eportfolio organisation as well as being useful to highlight any improvement needed (Strudler & Wetzel, 2011) provide teachers with a consistent instrument for assessment (Papp, 2014) and offer a better supervision process in different contexts (Raposo, Cebrián Robles & Cebrián de la Serna, 2015). Research has underlined benefits such as providing students with feedback and fostering deeper understanding and self-evaluation (Piedra, Chicaiza, López, Romero & Toval, 2010). It is crucial for teachers to share rubrics promoting openness, transparency and clarifying criteria as well as describing expected outcomes (Gikandi et al., 2011) and it helps by reducing students' anxiety (Panadero & Jonsson, 2013). However, they can be difficult to write and some pilot implementation and testing with a reduced number of participants is recommended in order to see how it works (Piedra et al., 2010). There are other factors that may moderate the positive impact of rubric formative assessment such as students' level or length of implementation, gender, topic or the combination with other metacognitive strategies (Panadero & Jonsson, 2013).

## III.The study

### a. Context and participants

The educational experience is carried out in the context of the subject Didactic and Curricular Design in the first year of the teacher training programmes at the University of the Balearic Islands, in the off-campus centre in Ibiza. The total number of students participating in the learning activity during the period 2011-2015 is 61: 11 in the academic year 2011-12; 16 in 2012-13; 15 in 2013-2014; and, 19 in 2014-15.

The learning activity was aimed at documenting learning on their individual eportfolios, and the same learning design was implemented all these four academic years with each group of students. Students wrote a weekly blogpost in which they had to reflect on new content and changes in their educational viewpoints along with a digital artefact. This periodic submission was assessed through a rubric, which was presented to students beforehand. The rubric was implemented as formative assessment carried out by the lecturer, who was the only person implementing and grading it weekly.

### b. Research purpose and objectives

This research aims to explore the evolution of students' rubric marks to see if results improve across its implementation.

In particular, the study is aimed at the following objectives:

- Check possible differences between Early Childhood and Primary Teacher Education

- Verify the consistency in the evolution of the marks throughout the 9 activities in the four cohorts
- Explore the evolution in the item "Reflection"

### c. Procedure and data collection

The study is carried out from a descriptive perspective based on the quantitative data obtained with the rubric implementation during the specified period, in the 9 aforementioned activities.
Data collection is carried out through the implementation of a rubric for the formative assessment of the eportfolio task. The rubric for assessment of eportfolio evidences is structured in four dimensions -content development, artefact, reflection and text-which are developed at four levels, from 0 to 3 points (a total of 12 points). The dimension of content development structures the knowledge acquired; the artefact is the digital work with which they document their learning; reflection structures how this new content affects and changes their vision of education; and, the text dimension includes levels at which the text is correct up to a level in which it is a complex text with internal and external links. The fundamental literature review on which it is based and the rubric itself are presented in a previous work (Tur & Urbina, 2016a).
The IBM SPSS statistical analysis software has been used to explore data.

## IV. Results

### a. Differences between Early Childhood and Primary Teacher Education groups

Based on the data analysis, it can be stated that there are no statistically significant differences (p=.199) between the aggregate average marks (total mean of the nine marks) from the Early Childhood (mean= 9.060) and Primary (mean= 8.681) groups. This would generally indicate a similar performance in both student sets, as shown in table 1.

| Pairwise comparison | | | | | | |
|---|---|---|---|---|---|---|
| (I)Degree | (J)Degree | Difference in mean (I-J) | Typ. error | Sig. c | 95% confidence interval for difference c | |
| | | | | | Lower limit | Upper limit |
| Early Childhood | Primary | .379 | .291 | .199 | -.206 | .964 |
| Primary | Early Childhood | -.379 | .291 | .199 | -.964 | .206 |
| c. Correction for multiple comparisons: Bonferroni. | | | | | | |

Table 1. Comparison of group averages

Nonetheless, we can also consider the marks in the nine measures without aggregating them, as shown in Table 2:

| Degree | Activ. | Mean | Typ. error | 95% Confidence interval | |
|---|---|---|---|---|---|
| | | | | Lower limit | Upper limit |
| Early Childhood | 1 | 5.764 | .308 | 5.145 | 6.383 |
| | 2 | 6.898 | .388 | 6.118 | 7.677 |
| | 3 | 7.864 | .376 | 7.109 | 8.618 |
| | 4 | 8.233 | .359 | 7.512 | 8.954 |

| | | | | | |
|---|---|---|---|---|---|
| | 5 | 9.841 | .263 | 9.313 | 10.369 |
| | 6 | 10.017 | .318 | 9.378 | 10.656 |
| | 7 | 10.070 | .273 | 9.522 | 10.617 |
| | 8 | 11.335 | .187 | 10.959 | 11.712 |
| | 9 | 11.520 | .182 | 11.155 | 11.885 |
| Primary | 1 | 3.708 | .298 | 3.109 | 4.306 |
| | 2 | 5.541 | .376 | 4.787 | 6.295 |
| | 3 | 8.879 | .364 | 8.149 | 9.610 |
| | 4 | 8.874 | .347 | 8.177 | 9.572 |
| | 5 | 9.354 | .254 | 8.843 | 9.865 |
| | 6 | 9.700 | .308 | 9.082 | 10.318 |
| | 7 | 10.226 | .264 | 9.696 | 10.755 |
| | 8 | 10.372 | .181 | 10.008 | 10.736 |
| | 9 | 11.474 | .176 | 11.121 | 11.828 |

Table 2. Average marks for each activity by group

Table 3 shows the paired comparison of means between the Early Childhood and Primary groups for each of the nine assessments:

| Activ. | (I)Degree | (J)Degree | Difference in mean (I-J) | Typ. error | Sig. d | 95% confidence interval for difference d | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Upper limit |
| 1 | Early Childhood | Primary | 2.057* | .429 | .000 | 1.196 | 2.917 |
| | Primary | Early Childhood | -2.057* | .429 | .000 | -2.917 | -1.196 |
| 2 | Early Childhood | Primary | 1.357* | .540 | .015 | .272 | 2.441 |
| | Primary | Early Childhood | -1.357* | .540 | .015 | -2.441 | -.272 |
| 3 | Early Childhood | Primary | -1.016 | .523 | .058 | -2.066 | .034 |
| | Primary | Early Childhood | 1.016 | .523 | .058 | -.034 | 2.066 |
| 4 | Early Childhood | Primary | -.641 | .500 | .205 | -1.644 | .362 |
| | Primary | Early Childhood | .641 | .500 | .205 | -.362 | 1.644 |
| 5 | Early Childhood | Primary | .487 | .366 | .189 | -.248 | 1.222 |
| | Primary | Early Childhood | -.487 | .366 | .189 | -1.222 | .248 |
| 6 | Early Childhood | Primary | .317 | .443 | .477 | -.572 | 1.206 |
| | Primary | Early Childhood | -.317 | .443 | .477 | -1.206 | .572 |
| 7 | Early Childhood | Primary | -.156 | .379 | .683 | -.918 | .606 |
| | Primary | Early Childhood | .156 | .379 | .683 | -.606 | .918 |
| 8 | Early Childhood | Primary | .963* | .261 | .001 | .440 | 1.487 |
| | Primary | Early Childhood | -.963* | .261 | .001 | -1.487 | -.440 |
| 9 | Early Childhood | Primary | .046 | .253 | .858 | -.463 | .554 |
| | Primary | Early Childhood | -.046 | .253 | .858 | -.554 | .463 |
| Based on marginal estimated averages. | | | | | | | |
| *. The difference in means is significant at level .05. | | | | | | | |
| d. Correction for multiple comparisons: Bonferroni. | | | | | | | |

Table 3. Pairwise comparison of average marks obtained in the activities

When comparing the average marks for each of the activities between the Early Childhood and Primary groups, statistically significant differences are only observed in activities 1 (p<.001), 2 (p=.015) and 8 (p=.001), and in all three instances with higher marks in the Early Childhood group.

**b. Consistency in the evolution of the marks throughout the nine activities in the four cohorts**

The differences between the marks for the nine measures across the four cohorts were then verified to see whether there exists any consistency in the evolution of the marks obtained.

The aggregate average marks for the nine activities in each cohort are as follows:

- Class of 11-12: 8.985
- Class of 12-13: 9.135
- Class of 13-14: 8.658
- Class of 14-15: 8.704

Table 4 shows there are no statistically significant differences between those four means of the total aggregate mark in the four cohorts, since a value of p=1.00 is obtained in all instances:

| Pairwise comparison | | | | | | |
|---|---|---|---|---|---|---|
| (I)Cohort | (J)Cohort | Difference in means (I-J) | Typ. error | Sig. c | 95% confidence interval for difference c | |
| | | | | | Lower limit | Upper limit |
| Class of 11-12 | Class of 12-13 | -.151 | .419 | 1.000 | -1.300 | .999 |
| | Class of 13-14 | .327 | .438 | 1.000 | -.876 | 1.529 |
| | Class of 14-15 | .281 | .424 | 1.000 | -.884 | 1.446 |
| Class of 12-13 | Class of 11-12 | .151 | .419 | 1.000 | -.999 | 1.300 |
| | Class of 13-14 | .477 | .399 | 1.000 | -.618 | 1.573 |
| | Class of 14-15 | .432 | .384 | 1.000 | -.623 | 1.486 |
| Class of 13-14 | Class of 11-12 | -.327 | .438 | 1.000 | -1.529 | .876 |
| | Class of 12-13 | -.477 | .399 | 1.000 | -1.573 | .618 |
| | Class of 14-15 | -.046 | .405 | 1.000 | -1.158 | 1.066 |
| Class of 14-15 | Class of 11-12 | -.281 | .424 | 1.000 | -1.446 | .884 |
| | Class of 12-13 | -.432 | .384 | 1.000 | -1.486 | .623 |
| | Class of 13-14 | .046 | .405 | 1.000 | -1.066 | 1.158 |
| c. Correction for multiple comparisons: Bonferroni. | | | | | | |

Table 4. Comparison between cohorts for aggregate activity averages

An analysis of the means for the different measures at the nine time points was also performed across the four cohorts (Table 5).

| Cohort | Act. | Mean | Typ. error | 95% Confidence interval | |
|---|---|---|---|---|---|
| | | | | Lower limit | Upper limit |
| Class of 11-12 | 1 | 6.091a | .475 | 5.138 | 7.044 |
| | 2 | 6.545a | .598 | 5.345 | 7.746 |

| | | | | | |
|---|---|---|---|---|---|
| | 3 | 6.727a | .579 | 5.565 | 7.889 |
| | 4 | 8.091a | .553 | 6.981 | 9.201 |
| | 5 | 10.182a | .405 | 9.369 | 10.995 |
| | 6 | 10.909a | .490 | 9.925 | 11.893 |
| | 7 | 9.545a | .420 | 8.703 | 10.388 |
| | 8 | 11.045a | .289 | 10.466 | 11.625 |
| | 9 | 11.727a | .280 | 11.165 | 12.290 |
| Class of 12-13 | 1 | 5.438a | .393 | 4.648 | 6.227 |
| | 2 | 7.250a | .496 | 6.255 | 8.245 |
| | 3 | 9.000a | .480 | 8.037 | 9.963 |
| | 4 | 8.375a | .458 | 7.455 | 9.295 |
| | 5 | 9.500a | .336 | 8.826 | 10.174 |
| | 6 | 9.125a | .406 | 8.309 | 9.941 |
| | 7 | 10.594a | .348 | 9.895 | 11.292 |
| | 8 | 11.625a | .239 | 11.145 | 12.105 |
| | 9 | 11.313a | .232 | 10.846 | 11.779 |
| Class of 13-14 | 1 | 4.615a | .437 | 3.739 | 5.492 |
| | 2 | 4.615a | .550 | 3.511 | 5.720 |
| | 3 | 8.692a | .532 | 7.624 | 9.761 |
| | 4 | 8.615a | .509 | 7.594 | 9.636 |
| | 5 | 9.308a | .373 | 8.560 | 10.056 |
| | 6 | 10.000a | .451 | 9.095 | 10.905 |
| | 7 | 10.385a | .386 | 9.609 | 11.160 |
| | 8 | 10.077a | .265 | 9.544 | 10.610 |
| | 9 | 11.615a | .258 | 11.098 | 12.133 |
| Class of 14-15 | 1 | 2.800a | .406 | 1.984 | 3.616 |
| | 2 | 6.467a | .512 | 5.439 | 7.495 |
| | 3 | 9.067a | .496 | 8.072 | 10.062 |
| | 4 | 9.133a | .473 | 8.183 | 10.084 |
| | 5 | 9.400a | .347 | 8.704 | 10.096 |
| | 6 | 9.400a | .420 | 8.557 | 10.243 |
| | 7 | 10.067a | .359 | 9.345 | 10.788 |
| | 8 | 10.667a | .247 | 10.170 | 11.163 |
| | 9 | 11.333a | .240 | 10.852 | 11.815 |
| a. Based on modified population marginal mean. | | | | | |

Table 5. Average marks obtained in each activity by cohort

The existence of statistically significant differences between the measures at each time point and for the four cohorts was then verified.

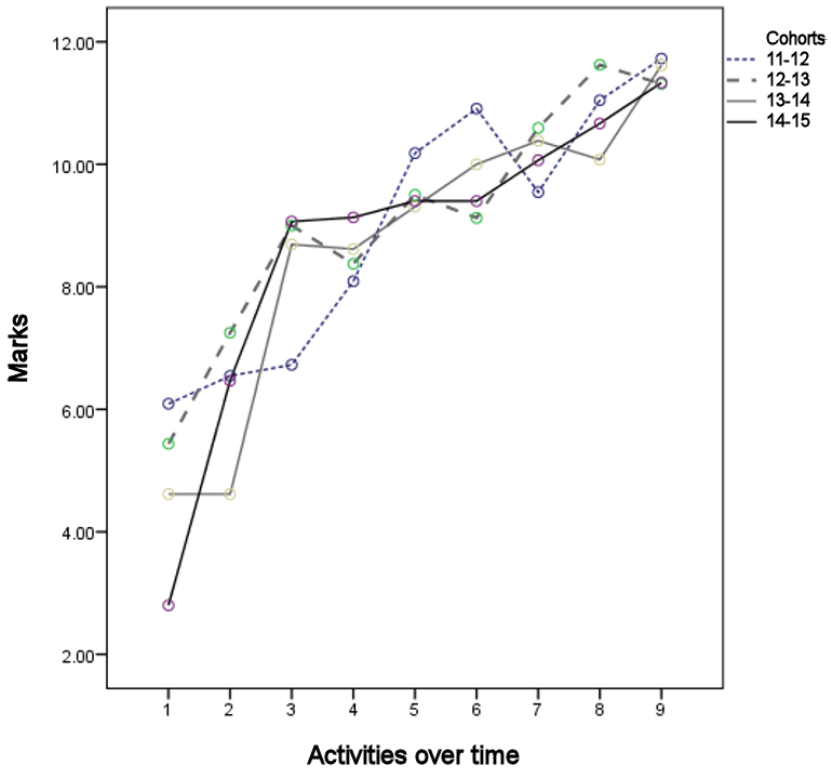
Some specific significances were found between the cohorts, as shown in Table 6. Due to space restrictions, differences that are not significant have not been included, although each cohort has consistently been compared with the other three for each activity/time.

| Pairwise comparison | | | | | | | |
|---|---|---|---|---|---|---|---|
| Act. | (I)Cohort | (J)Cohort | Difference in means (I-J) | Typ. error | Sig.[d] | 95% confidence interval for difference[d] | |
| | | | | | | Lower limit | Upper limit |
| 1 | Class of 11-12 | Class of 14-15 | 3.291* | .625 | .000 | 1.576 | 5.006 |
| | Class of 12-13 | Class of 14-15 | 2.638* | .566 | .000 | 1.085 | 4.190 |
| | Class of 13-14 | Class of 14-15 | 1.815* | .596 | .022 | .178 | 3.452 |
| | Class of 14-15 | Class of 11-12 | -3.291* | .625 | .000 | -5.006 | -1.576 |
| | | Class of 12-13 | -2.638* | .566 | .000 | -4.190 | -1.085 |
| | | Class of 13-14 | -1.815* | .596 | .022 | -3.452 | -.178 |
| 2 | Class of 12-13 | Class of 13-14 | 2.635* | .740 | .005 | .602 | 4.667 |
| | Class of 13-14 | Class of 12-13 | -2.635* | .740 | .005 | -4.667 | -.602 |
| 3 | Class of 11-12 | Class of 12-13 | -2.273* | .752 | .023 | -4.336 | -.209 |
| | | Class of 14-15 | -2.339* | .762 | .021 | -4.431 | -.248 |
| | Class of 12-13 | Class of 11-12 | 2.273* | .752 | .023 | .209 | 4.336 |
| | Class of 14-15 | Class of 11-12 | 2.339* | .762 | .021 | .248 | 4.431 |
| 6 | Class of 11-12 | Class of 12-13 | 1.784* | .637 | .043 | .036 | 3.532 |
| | Class of 12-13 | Class of 11-12 | -1.784* | .637 | .043 | -3.532 | -.036 |
| 8 | Class of 12-13 | Class of 13-14 | 1.548* | .357 | .000 | .567 | 2.529 |
| | | Class of 14-15 | .958* | .344 | .045 | .014 | 1.903 |
| | Class of 14-15 | Class of 12-13 | -.958* | .344 | .045 | -1.903 | -.014 |
| *. The difference in means is significant at level .05. | | | | | | | |
| d. Correction for multiple comparisons: Bonferroni. | | | | | | | |

Table 6. Significant differences between cohorts at each time point/activity

Thus, for example, a significant difference can be seen in the first time point between the mark for the classes of 11-12 and 14-15 of 3.291 points, with a significance level of $p<.001$; there is also a difference between the mark for the classes of 12-13 and 14-15 of 2.638 points ($p<.001$), also at point one. At time point three, there are significant differences between the classes of 11-12 and 12-13 of 4.336.

In turn, there is no significant difference between the cohorts at the time points for activities 4, 5, 7 and 9, meaning they have not been included in the table. To better visualize these results, a line graph is provided below showing both the evolution of the marks over time and the differences between the four cohorts over the nine time points.




Graph 1. Comparison of marks over time for each cohort

### c. Trend analysis for the evolution of the nine measures aggregating all study subjects

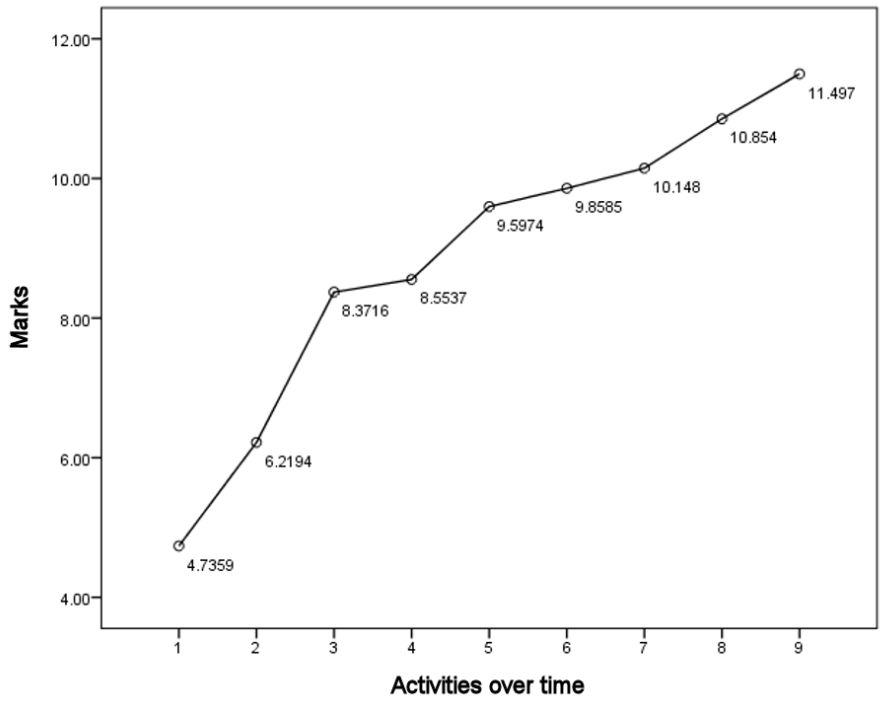
Table 7 shows the final average marks for the nine time points for the entire sample:

| Estimates | | | | |
|---|---|---|---|---|
| Act. | Mean | Typ. error | 95% confidence interval | |
| | | | Lower limit | Upper limit |
| 1 | 4.736a | .214 | 4.305 | 5.166 |
| 2 | 6.219a | .270 | 5.677 | 6.762 |
| 3 | 8.372a | .262 | 7.847 | 8.897 |
| 4 | 8.554a | .250 | 8.052 | 9.055 |
| 5 | 9.597a | .183 | 9.230 | 9.965 |
| 6 | 9.859a | .221 | 9.414 | 10.303 |
| 7 | 10.148a | .190 | 9.767 | 10.528 |
| 8 | 10.854a | .130 | 10.592 | 11.115 |
| 9 | 11.497a | .127 | 11.243 | 11.751 |
| a. Based on modified population marginal mean. | | | | |

Table 7. Aggregate average marks for the 9 activities

After performing contrast tests between each of the means for the nine activities, statistically significant differences were found between all consecutive time points, except between points 3 and 4 (p=1.00) and between points 5, 6 and 7 (p=.396, p=1.00).

After analysing the trend for the evolution in the marks from a statistical standpoint through different polynomial correction models (linear, quadratic, cubic, 4th order, 5th order, etc.), and in accordance with the results, the model that best fits the trend for the evolution of the marks across the nine time points is the first order, i.e. linear trend ($p<.001$) with a partial Eta-squared value of .947. This means that the linear trend explains 94.7% of the evolution of the marks over time.
This is shown clearly in Graph 2:




Graph 2. Linear trend in the evolution of the marks over time

**d. Evolution in the "Reflection" item**

Table 8 below shows the average marks for the "Reflection" item across the nine time points in question.

| Descriptive statistics | | | |
|---|---|---|---|
| | Mean | Standard deviation | N |
| E1REFLEX | 0.5641 | .68036 | 39 |
| E2REFLEX | 1.0513 | .94448 | 39 |
| E3REFLEX | 1.5128 | .72081 | 39 |
| E4REFLEX | 1.7949 | .52212 | 39 |
| E5REFLEX | 2.1026 | .68036 | 39 |
| E6REFLEX | 2.1795 | .60139 | 39 |
| E7REFLEX | 2.1795 | .64367 | 39 |
| E8REFLEX | 2.5385 | .55470 | 39 |
| E9REFLEX | 2.8974 | .30735 | 39 |

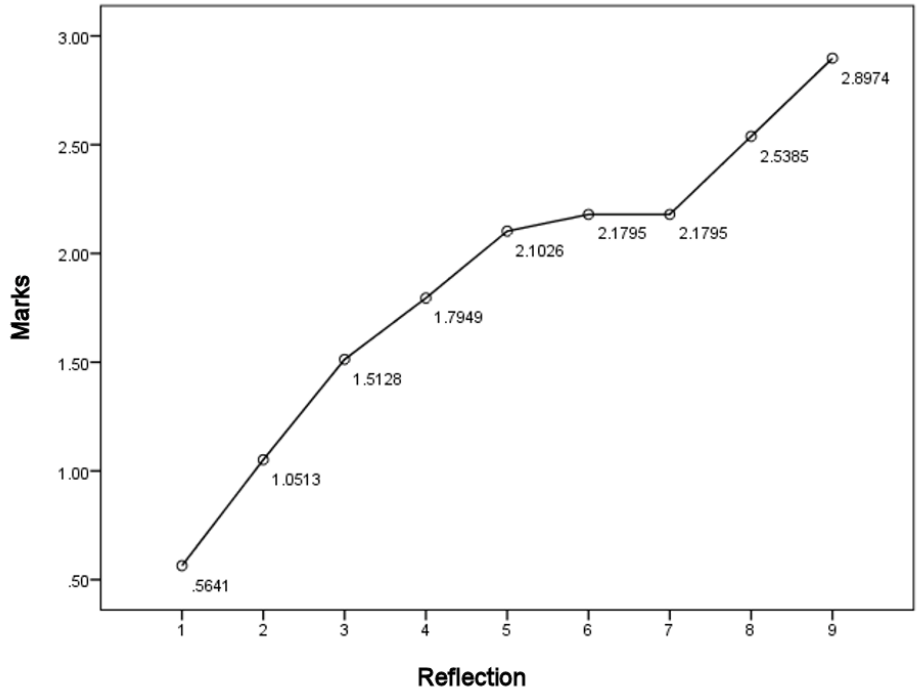
Table 8. Average marks for Reflection item in the 9 activities

The F-test for contrasting the means is significant ($F_{5.816,220.997}$=77.59, p<.001), with a partial Eta-squared equal to 0.671 and an observed power of 1.00.

After performing the paired difference tests, the results showed a similar pattern to that for total marks. No significant differences are observed between consecutive points 1 and 2 (p=.052), 2 and 3 (p=.061), 3 and 4 (p=.516), 4 and 5 (p=.120), 5 and 6 (p=1.00), 6 and 7 (p=1.00), 7 and 8 (p=.065), and 8 and 9 (p=.065).

There are, however, significant differences between 1 and 3 (p<.001), 3 and 5 (p<.001), and 7 and 9 (p<.001).

As with the total marks, the reflection item also shows a significant linear trend pattern (p<.001) with a partial ETA-squared of .933 and an observed power of 1.00. Graph 3 shows this linear trend:




Graph 3. Linear trend in the evolution of the Reflection item over time

## V. Discussion and conclusion

We are convinced that the joint work with process eportfolios and formative assessment contributes to fostering student autonomy, increasing their engagement and self-awareness of their abilities and strategies as well as difficulties and their evolution. In this sense, this learning experience, based on the use of rubrics to assess student performance in the construction of their digital process eportfolio, is in line with self-regulated learning aims (Raposo & Sarceda, 2010; Gikandi et al.2011; Lai and Hwang 2015; Wang 2014; Abrami et al, 2013; Meyer et al., 2010). Likewise, it is coherent with the connection of formative assessment and process eportfolio with

blogs (Panke, 2014; Aguaded et al., 2013; Hatzipanagos & Warburton, 2009). The usage of both eportfolio and rubrics for written feedback is the combination of two of the resources for best ICT-based assessment practices list by e-AFFECT JISC report in 2014 (Moreno & Rochera, 2016). Furthermore, the usage of ICT and social media is also in line with the aim of influencing both pre and in-service teachers' digital competencies as claimed in international research (Soomro, Kale & Zai, 2014; Lim, Yan & Xiong, 2015; Tan & Kou, 2014).

Formative assessment has been carried out with a commitment to afford student agency and ownership of their own learning (Charteris, Quinn, Parkes, Fletcher & Reyes, 2015; Ng & Lai, 2012) and has supported assessment both by the teacher and students themselves (Sellami, 2015). The rubric implementation has been planned as a "formative guidance process", a quality feedback claimed by Beaumont, O'Doherty, and Shannon (2011, p. 682). The skills to plan, monitor and self-reflect on learning involve a need for formative feedback so as to be able to self-regulate their own learning. Following previous work in eportfolio by Abrami et al. (2013), and Meyer et al. (2010) and in rubrics by Fraile (2017), both the process eportfolio and the rubric can be a strategic instrument for the three phases defined by Zimmerman (2002): it can help students plan their learning in the forethought phase; also, it can be the guide to monitor it during performance; and eventually, a rubric can facilitate self-assessment as it becomes the standard with which to measure the level achieved.

The rubric has enabled feedback, as claimed by Piedra et al. (2010); it has been systematic, and explicit and clear information has provided new opportunities, since each week students were able to improve their work. Its design has contemplated some characteristics of the good feedback referred to in research by Sancho-Vinuesa and Escudero (2012). It has been transparent and clear for the students as suggested in previous research (Gikandi et al., 2011). Therefore, it has helped students to play an active role in assessment, promoting self-reflection and responsibility in their own learning (Cukusic, Garaca & Jadric, 2014; De Wever, Van Keer, Schellens & Valcke, 2011; Gielen, Dochy & Onghena, 2011).

The current study offers valuable data based on real outcomes, overcoming limitations of previous research, which suggests learning improvement based on students' perceptions (Zimmerman, 2002; Panadero & Jonsson, 2013). Data obtained is in line with previous research that suggests the positive effect for self-regulated learning of rubric-based formative assessment (Panadero & Jonsson, 2013). First of all, the results generally suggest that there are no significant differences between students from Early Childhood and Primary Teacher Education in particular, since all four cohorts achieved analogous high marks at the end of the semester. However, there are some differences enabling us to put forward new hypotheses for testing in future research. At first glance, the low marks of one cohort at the very beginning of the learning activity may suggest that even when starting with low or very low performance, students can attain similar good results. Also, as for the significant difference in points 1, 2 and 8 among Early Childhood and Primary Teacher Education students, one could expect that the former may start with generally higher learning skills than the latter and could thus attain higher marks earlier. Secondly, with regard to the study's second objective, the data confirms the consistent nature of student progress throughout the term as significant differences can be seen at almost all assessment points. Nonetheless, there are some points in time where there are no significant differences. This is true

for the third, fourth, sixth, seventh and eighth assessments, where one could deduce that after initial progress or improvement at intermediate time points, later improvements become more difficult to attain, requiring more time and effort. Based on this, new educational implementation should also be aware of reinforcing feedback in assessment at intermediate points in time. Thirdly, in terms of reflective skills, the same progressive improvement pattern can be observed in student marks, although there is still one relevant difference: there is no significant difference between consecutive results and significance is only observed every other week. This result leads us to suggest that reflective skills are hard to achieve and require more time, feedback and effort to eventually show further improvement. These results are in line with previous research by authors who observed that students had struggled in the reflective parts of their tasks more than in others (Tur & Urbina, 2014; Tur et al., 2016; Tur & Urbina, 2016b).

However, it is necessary to consider some limitations of the current usage of rubrics for formative assessment of eportfolios. First of all, transparency can enhance instrumentalism (Panadero & Jonsson, 2013). Thus, future educational implementations should be able to avoid the possibility that students are trained for performance and assessment rather than self-regulated learning. And secondly, the combination of rubrics with eportfolios may be an element of moderation of current results (Panadero & Jonsson, 2013). So, future work should include rubrics along with other didactic strategies in order to explore its real impact. The usage of a rubric for eportfolio assessment can have challenging new iterations. So far, the rubric has been used to improve assessment carried out by teachers. However, rubrics are also interesting for self and peer assessment. Thus, future implementations should improve the activity at order to give students more opportunities for self-assessment; and, in particular, real collaboration that enhances peer assessment. Also, two lines of research can be studied in further work: the systematization of data collection in order to foster self-regulated learning; and, the transference of the current learning design to other subjects and science domains.

Furthermore, there are some arguments that may encourage future new implementation and research in terms of rubric-based formative feedback for all. Firstly, since rubrics have been claimed as powerful tools in the self-regulated learning framework, this innovative practice also has implications for the achievement gap in social minority groups in which the use of self-regulated instruments were observed to have positive impact on their results (Dee, 2015). Secondly, the introduction of assessment through a digital environment may have responded to the diversity of students, including those who do not feel comfortable in traditional settings (Kivinen, Piiroinen & Saikkonen, 2016). Thus, this may suggest that the current assessment practice has attended some characteristics of inclusive assessment defined by research: assessment was beneficial and suitable for all (Douglas et al., 2016). Due to the limitations of this study, a new iteration of the learning design and more data are needed for further research in which to explore the potential of formative feedback through eportfolio as an answer to all students' needs in other areas of knowledge.

Finally, there is a special concern that should be highlighted, relating to the organisational aspects of the learning activity reported in this work. Future iterations should address the challenge of sustainability in feedback practices, as claimed by Carless, Salter, Yang and Lam (2011). Giving students weekly feedback is an enormous workload for the teacher. In this case, it has been possible, due to the reduced size of the groups, but it would appear that such a workload would

make the development of the activity very difficult in bigger groups –the overwhelming workload generated in similar writing activities has already been reported (Rosselló & Pinya, 2017). Therefore, further research should explore suitable strategies for larger groups. However, following this satisfactory experience, and due to the exhaustion that it has provoked, with the conviction that eportfolio work should continue, it is time to explore other ways of organising feedback and rubric-based formative assessment even in the case of small groups. For instance, would it be the same if feedback was given each week to half of the group? Would it be the same if work was carried out in pairs? In what sense might collaboration among students improve their own learning? Would this new organisation of eportfolio work guarantee the same opportunities for all? Would the group improve learning to the same extent? In this case, further research is needed in order to analyse impact and compare it with previous results.

## References


Abrami, P. C., Venkatesh, V., Meyer, E. J., & Wade, C. A. (2013). Using electronic portfolios to foster literacy and self-regulated learning skills in elementary students. *Journal of Educational Psychology, 105*(4), 1188-1209. doi: 10.1037/a0032448

Aguaded, J.I., López Meneses, E., & Jaén, A. (2013). University e-Portfolios as a New Higher Education Teaching Method. The Development of a Multimedia Educational Material (MEM). *Universities and Knowledge Society Journal (RUSC),10* (1), 188-209. doi: 0.7238/rusc.v10i1.1333

Alexiou, A. & Paraskeva, F. (2010). Enhancing self-regulated learning skills through the implementation of an e-portfolio tool. *Procedia Social and Behavioral Sciences, 2*, 3048-3054. doi: 10.1016/j.sbspro.2010.03.463

Alexiou, A. & Paraskeva, F. (2013, June 12-14). Exploiting motivation and self-efficacy through the implementation of self-regulated oriented ePortfolio. Paper presented at The International Conference on E-Learning in the Workplace, New York, USA. Retrieved from https://www.icelw.org/proceedings/2013/ICELW2013/papers/Alexiou_Paraskeva.pdf

Beaumont, C., O'Doherty, M., & Shannon. L. (2011). Reconceptualising assessment feedback: a key to improving student learning? *Studies in Higher Education, 36* (6), 671-687. doi: 10.1080/03075071003731135

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 1-13. Retrieved from https://rdc.udel.edu/wp-content/uploads/2015/04/InsideBlackBox.pdf

Boer,A., Pijl, S.J., & Minnaert , A. (2011). Regular primary schoolteachers' attitudes towards inclusive education: a review of the literature. *International Journal of Inclusive Education, 15(*3), 331-353. doi: 10.1080/13603110903030089

Cambridge, D. (2010). *E-portfolios for lifelong learning and assessment*. San Francisco: Jossey-Bass.

Carless, D., Salter, D., Yang, M., & Lam, J. (2011). Developing sustainable feedback practices. *Studies in Higher Education, 36*(4), 396-407. doi: 10.1080/03075071003642449

Charteris, J., Quinn, F., Parkes, M., Fletcher, P., & Reyes, V. (2015). e-Assessment for Learning (eAfL) in higher education: is it a wolf in sheep's clothing? *Journal of Learning Development in Higher Education, 9*. Retrieved from http://www.aldinhe.ac.uk/ojs/index.php?journal=jldhe&page=article&op=view&path%5B%5D=278

Cheng, G. & Chau, J. (2013). A study of the effects of goal orientation on the reflective ability of electronic portfolio users. *The Internet and Higher Education, 16*, 51–56. doi:10.1016/j.iheduc.2012.01.003

Cukusic, M., Garaca, Z., & Jadric, M. (2014). Online self-assessment and students' success in higher education institutions. *Computers & Education, 72*, 100–109. doi: 10.1016/j.compedu.2013.10.018

Dalmau, M., Guasch, D., Sala, I., Llinares,M., Dotras, P., Álvarez, H., & Giné. C. (2015). Diseño universal para la instrucción: indicadores para su implementación en el ámbito universitario. Universitat Politècnica de

Catalunya. Retrieved from http://upcommons.upc.edu/bitstream/handle/2117/27277/diseno_universal_universidad.pdf?sequence=2&isAllowed=y

De Wever, B., Van Keer, H., Schellens, T., & Valcke, M. (2011). Assessing collaboration in a wiki: the reliability of university students' peer assessment. *The Internet and Higher Education, 14*(4), 201–206. doi:10.1016/j.iheduc.2011.07.003

Dee, T.S. (2015). Social Identity and Achievement Gaps: Evidence From an Affirmation Intervention. *Journal of Research on Educational Effectiveness, 8*(2), 149-168. doi: 10.1080/19345747.2014.906009

Douglas, G., McLinden,M., Robertson, C.,Travers, J., & Smith, E. (2016).Including Pupils with Special Educational Needs and Disability in National Assessment: Comparison of Three Country Case Studies through an Inclusive Assessment Framework. *International Journal of Disability, Development and Education, 63*(1), 98-121. doi: 10.1080/1034912X.2015.1111306

Fraile, J., Pardo, R., & Panadero, E. (2017). ¿Cómo emplear las rúbricas para implementar una verdadera evaluación formativa?. *Revista Complutense de Educación, 28*(4), 13-21. doi: 10.5209/RCED.51915

Galván-Fernández, C., Rubio-Hurtado, M., Martínez-Olmo, F., & Rodríguez-Illera, J. (2017). Can the integration of a PLE in an e-portfolio platform improve generic competences?. *Journal of New Approaches in Educational Research, 6*(2), 112-118. doi: 10.7821/naer.2017.7.230

Gámiz, V., Montes, R., & Pérez, M.C. (2014). Self-assessment via a blended-learning strategy to improve performance in an accounting subject. *RUSC. Universities and Knowledge Society Journal (RUSC), 11*(2), 41-54. doi http://dx.doi.org/10.7238/rusc.v11i2.2055

Gaytan, J., & McEwen, B. C. (2007). Effective online instructional and assessment strategies. *American Journal of Distance Education, 21*(3), 117–132. doi: 10.1080/08923640701341653

Gielen, S. Dochy, F., & Onghena, P (2011). An inventory of peer assessment diversity. *Assessment & Evaluation in Higher Education, 36,* 137–155. doi: 10.1080/02602930903221444

Gikandi, J.W., Morrow, D., & Davis, N.E. (2011). Online formative assessment in higher education: A review of the literatura. *Computers & Education, 57*, 2333–2351. doi: 10.1016/j.compedu.2011.06.0 04

Gunawardena, C. N., Hermans, M. B., Sanchez, D., Richmond, C., Bohley, M., & Tuttle, R. (2009). A theoretical framework for building online communities of practice with social networking tools. *Educational Media International*, *46*(1), 3-16. doi: 10.1080/09523980802588626

Hatzipanagos, S. & Warburton, S. (2009). Feedback as dialogue: exploring the links between formative assessment and social software in distance learning *Learning, Media and Technology, 34*(1), 45-59. doi: 10.1080/17439880902759919

Hemmings, B. Kemmis, S., & Reupert,A. (2013). Practice architectures of university inclusive education teaching in Australia. *Professional Development: Education For All As Praxis, 39*(4), 470-487. doi: 10.1080/19415257.2013.796293

Herro, D. (2014). Techno Savvy: a Web 2.0 curriculum encouraging critical thinking. *Educational Media International, 51*(4), 259-277. doi: 10.1080/09523987.2014.977069

Kabilan, M.A. & Khan, M.K. (2012). Assessing pre-service English language teachers' learning using e-portfolios: Benefits, challenges and competencies gained. *Computers & Education, 58*, 1007–1020. doi: 10.1016/j.compedu.2011.11.011

Karsenti, T., Dumouchel, G., & Collin, S. (2014). The Eportfolio as Support for the Professional Development of Preservice Teachers: a Theoretical and Practical Overview. *International Journal of Computers & Technology, 12*(5), 3486-3495. Retrieved from http://cirworld.org/journals/index.php/ijct/article/view/671

Kivinen, O., Piiroinen, T., & Saikkonen, L. (2016). Two viewpoints on the challenges of ICT in education: knowledge-building theory vs. a pragmatist conception of learning in social action. *Oxford Review of Education, 42*(4), 377-390. doi: 10.1080/03054985.2016.1194263

Lai, C. L. & Hwang, G.J. (2015). An interactive peer-assessment criteria development approach to improving students' art design performance using handheld devices. *Computers & Education, 85*, 149-159. doi: 10.1016/j.compedu.2015.02.011

Lim, C.P., Yan, H., & Xiong, X. (2015). Development of pre-service teachers' information and communication technology (ICT) in education competencies in a mainland Chinese university. *Educational Media International, 52*(1), 15-32. doi: 10.1080/09523987.2015.1005425

Meyer, E., Abrami, P. C., Wade, C. A., Aslan, O., & Deault, L. (2010). Improving literacy and metacognition with electronic portfolios: Teaching and learning with ePEARL. *Computers and Education, 55*(1), 84-91. doi:10.1016/j.compedu.2009.12.005

Moreno, L.L. & Rochera, M.J. (2016). Uses of ICT and Timing in Evaluative Practices of Teachers in Upper Secondary Education. *Digital Education Review, DER, 30*, 147-164. Retrieved from http://revistes.ub.edu/index.php/der/article/view/15235/pdf

Ng, E. M. W. & Lai, Y. C. (2012). An exploratory study on using wiki to foster student teachers' learner-centered learning and self and peer assessment. *Journal of Information Technology Education: Innovations in Practices, 11*, 71–84. Retrieved from http://www.jite.org/documents/Vol11/JITEv11IIPp071-084NG1096.pdf

Nicol, D.J. & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199-218. doi: 10.1080/03075070600572090

Nicol, D. J. & Milligan, C. (2006). Rethinking technology-supported assessment in terms of the seven principles of good feedback practice. In C. Bryan and K. Clegg (Eds), *Innovative Assessment in Higher Education* (pp.64-79). London: Taylor and Francis Group Ltd, London.

Pachler, N., Daly, C., Mor, Y., & Mellar, H. (2010). Formative e-assessment: Practitioner cases. *Computers & Education, 54*, pp. 715–721. Doi: 10.1016/j.compedu.2009.09.032

Panadero, E. & Jonsson, A. (2013). The use of scoring rubrics for formative assessment purposes revisited: A review. *Educational Research Review*, *9*, 129-144. doi: 10.1016/j.edurev.2013.01.002

Panadero, E. & Alonso-Tapia, J. (2014). How do students self-regulate? Review of Zimmerman's cyclical model of self-regulated learning. *Anales de Psicología/Annals of Psychology*, *30*(2), 450-462. doi: 10.6018/analesps.30.2.167221

Panke, S. (2014). E-Portfolios in Higher Education Settings: A Literature Review. *E-Learn 2014*- New Orleans, LA, United States, October 27-30. Retrieved from https://www.safetynet-solutions.com.au/uploads/2/6/0/6/26060087/eportfolios.pdf

Peacock, S., Murray, S., Scott, A. & Kelly, J. (2011). The Transformative Role of ePortfolios: Feedback in Healthcare Learning. *International Journal of ePortfolio, 1*(1), 33-48. Retrieved from http://www.theijep.com/pdf/ijep28.pdf

Penny, L. & Murphy, E. (2009). Rubrics for designing and evaluating online asynchronous discussions. *British Journal of Educational Technology, 40*(5), 804–820. doi: 10.1111/j.1467-8535.2008.00895.x.

Piedra, N., Chicaiza, López, J., Romero, A., & Tovar, E. (2010). Measuring collaboration and creativity skills through rubrics – experience from UTPL collaborative social networks course. In Paper presented at *IEEE EDUCON education Engineering 2010 – The future of global learning engineering education*. doi: 10.1109/EDUCON.2010.5492349.

Raposo, M.; Cebrián Robles, V. & Cebrián de la Serna, M. (2015). Erubric For The Assessment Of Skills And Content In The External Practices: Legal Aspects. *ECER 2015*. doi: 10.13140/RG.2.1.3917.2320

Raposo, M. & Sarceda, M. C. (2010). El trabajo en las aulas con perspectiva europea: medios y recursos para el aprendizaje autónomo. *Enseñanza & Teaching, 28*(2), 45-60. Retrieved from http://campus.usal.es/~revistas_trabajo/index.php/0212-5374/article/viewFile/7889/8359

Raposo-Riva, M. & Gallego-Arrufat, M.J. (2016). University students' perceptions of electronic rubric-based assessment. *Digital Education Review, DER,* 30, pp. 220-233. Retrieved from http://revistes.ub.edu/index.php/der/article/view/15442/pdf_1

Rodríguez Illera, J.L., Galván, C., & Martínez Olmo, F. (2013). El portafolios digital como herramienta para el desarrollo de competencias transversales. *Teoría de la Educación. Educación y Cultura en la Sociedad de la Información (TESI), 14*(2), 157-177. Retrieved from http://campus.usal.es/~revistas_trabajo/index.php/revistatesi/article/view/10218/10627

Rosselló, M.R. & Pinya, C. (2017). Using blogs to improve professional competencies among undergraduate students. *Digital Education Review, DER*, *31*, 20-38. Retrieved from http://revistes.ub.edu/index.php/der/article/view/15910/pdf

Sancho-Vinuesa, T. & Escudero, N. (2012). ¿Por qué una propuesta de evaluación formativa con feedback automático en una asignatura de matemáticas en línea? *Revista de Universidad y Sociedad del Conocimiento* (*RUSC*), *9*(2), 59-79. doi: 10.7238/rusc.v9i2.1285

Saul, C. & Wuttke, H.D. (2011). Feedback Personalization as Prerequisite for Assessing Higher-order Thinking Skills. *European Journal of Open, Distance and E-learning. EURODL, 14(2).* Retrieved from http://www.eurodl.org/index.php?p=special&sp=articles&inum=3&article=445

Sellami, H.M (2015). What are Web 2.0 Competences and Why are They Important? – A Proposal to Enrich ePortfolio Standards**.** *European Journal of Open, Distance and E-learning. EURODL*, 18(1). Retrieved from http://www.eurodl.org/?p=archives&sp=brief&year=2015&halfyear=1&article=688

Soomro, K.A., Kale, U., & Zai, S.Y. (2014). Pre-service teachers' and teacher-educators' experiences and attitudes toward using social networking sites for collaborative learning. *Educational Media International, 51*(4), 278-294. doi: 10.1080/09523987.2014.977003

Strudler, N. & Wetzel, K. (2011). Electronic Portfolios in Teacher Education: Forging a Middle Ground. *Journal of Research on Technology in Education, 44*(2), 161–173. doi: 10.1080/15391523.2011.10782584

Tan, V. & Kou, X. (2014). Case-based reasoning to help educators design with Web 2.0. *Educational Media International, 51*(2), 91-108. doi: 10.1080/09523987.2014.924662

Tierney, R. & Simon, M. (2004). What's still wrong with rubrics: focusing on the consistency of performance criteria across scale levels. *Practical Assessment, Research & Evaluation, 9*(2), 1-10. Retrieved from http://PAREonline.net/getvn.asp?v=9&n=2

Topping, K. (2003). Self and Peer Assessment in School and University: Reliability, Validity and Utility. In M. Segers, F. Dochy and E. Cascallar (eds.), *Optimising new models of assessment: in sear*The role of e-portfolios in supporting productive learning. (pp. 55-87). Dordrecht: Kluwer Academic Publishers.

Tur, G. & Urbina, S. (2014) Blogs as Eportfolio Platforms in Teacher Education: Affordances and Limitations Derived from Student Teachers' Perceptions and Performance on their Eportfolios. Digital Education Review, 26,1-23. Retrieved from http://revistes.ub.edu/index.php/der/article/view/11578

Tur, G, Marín, V.I., Moreno, J., Gallardo, A., & Urbina, S. (2016). From Diagrams to Self-regulated Learning: Student Teachers' Reflections on the Construction of their PLE. *Educational Media International,* 53(2), 139-152. https://doi.org/10.1080/09523987.2016.1211335

Tur, G. & Urbina, s. (2016a). Rúbrica para la evaluación de portafolios electrónicos en el entorno de la web social**.** *Píxel-Bit. Revista de Medios y Educación, 48*, pp. 83-96. doi: 10.12795/pixelbit.2016.i48.06

Tur, G. & Urbina, S. (2016b). Collaboration in ePortfolios with Web 2.0 tools in initial teacher training / La colaboración en eportafolios con herramientas de la Web 2.0. en la formación docente inicial. *Cultura y Educación*, 28(3). doi: 10.1080/11356405.2016.1203528

Wang, C. (2009). Comprehensive assessment of student collaboration in electronic portfolio construction: an evaluation research. *TechTrends, 53*(1), 58-67. doi: 10.1007/s11528-009-0238-

Wang, T.H. (2014). Developing an assessment-centered e-Learning system for improving student learning effectiveness. *Computers & Education, 74*, 189–203. doi: 10.1016/j.compedu.2013.12.002

Wiliam, D. (2011). What is assessment for learning?. *Studies in educational evaluation*, *37*(1), 3-14. doi: 10.1016/j.stueduc.2011.03.001

Yang, M., Tai, M., & Lim, C. P. (2016).The role of e-portfolios in supporting productive learning. *British Journal of Educational Technology*, *46*(6), 1276–1286. doi:10.1111/bjet.12316

Yastibas, A.E. & Yastibas, G.C. The Use of E-portfolio-based Assessment to Develop Students' Self-regulated Learning in English Language Teaching. *Procedia - Social and Behavioral Sciences, 176,* 3-13. doi: 10.1016/j.sbspro.2015.01.437